ATMOS
MedizinTechnik

English

Operating instructions

ATMOS®
E 201 Thorax

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Table of contents

1.0 Introduction ... 3-7
1.1 Notes on operating instructions ... 3
1.2 Intended use ... 3-4
1.3 Warnings ... 4
1.4 Precautions ... 5
1.5 Function ... 5
1.6 Explanation of pictures and symbols ... 6
1.7 Scope of supply ... 7
1.8 Transport and storage ... 7

2.0 For your safety ... 8

3.0 Setting up and starting up ... 9-10
3.1 Setting up ... 9
3.1.1 Display / Operating elements ... 9
3.2 Starting up ... 9
3.3 Functional test ... 10

4.0 Operation ... 11-17
4.1 Adjust vacuum ... 11
4.2 Suction procedure ... 11
4.3 Hose rinsing ... 11
4.4 Battery recharging ... 11
4.5 Canister ... 12
4.5.1 Filling the water lock ... 12
4.5.2 Pop-off valve ... 12
4.5.3 Insertion of the canister ... 12
4.5.4 Hose holder at the canister ... 12
4.6 Connect hose set ... 13
4.7 Universal support (optional) ... 13
4.8 Information on the display ... 14
4.9 Display function ... 14
4.9.1 Switch on menu ... 14
4.9.2 Adjusting the vacuum ... 14
4.9.3 Leakage test ... 14
4.9.4 Keylock ... 15
4.9.5 Exchange of canister ... 15
4.9.6 Switch off ... 15
4.10 Settings menu ... 16
4.11 Alarm ... 17

5.0 Cleaning ... 18
5.1 General information on cleaning and disinfection ... 18
5.2 Cleaning the device surface ... 18

6.0 Maintenance and service ... 19
6.1 Basic information ... 19
6.2 Reprocessing ... 19
6.3 Battery handling ... 19
6.4 Exchange of fuses ... 19

7.0 Trouble shooting ... 20

8.0 Accessories and consumables ... 21
8.1 Accessories ... 21
8.2 Consumables ... 21

9.0 Technical specifications ... 21-23
9.1 Technical specifications secretion canister ... 21
9.2 Technical specifications hose system ... 22
9.3 Technical specifications ATMOS® E 201 Thorax ... 23

10.0 Checking / Reprocessing / Disposal ... 24
10.1 Checking ... 24
10.2 Reprocessing ... 24
10.3 Disposal ... 24

11.0 Notes on EMC ... 25-27

Further information, accessories, consumables and spare parts are available from:

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1.0 Introduction

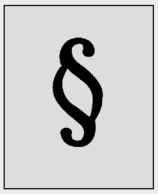
1.1 Notes on operating instructions

These operating instructions contain important notes on how to operate the ATMOS® E 201 Thorax safely, correctly and effectively. Their reading helps to avoid risks, and also to reduce repair costs and down-time. That increases, amongst other things, the reliability and service-life of the device. These operating instructions serve not only for new operating personnel to be instructed in its use, but also for use as a reference manual. Reproduction of these instructions – even in part – only with the written permission of ATMOS.

These operating instructions must always be kept available near the device.

Care and safety inspections in conjunction with professional execution provide for operational safety and readiness for use of your ATMOS® E 201 Thorax and are therefore a must besides regular cleaning.

Repair work and safety inspections may be carried out only by expert personnel authorised by ATMOS. By applying only original spare parts you will have the guarantee that operational safety, readiness for work and the value of your ATMOS® E 201 Thorax will be preserved.



- The product ATMOS® E 201 Thorax bears CE marking according to the EC Directive of the council for medical products 93/42/EEC and meets the basic requirements of annex I of this directive.
- The product ATMOS® E 201 Thorax complies with all applicable requirements of the directive 2011/65/EC restricting the use of certain hazardous substances in electrical and electronic equipment (“RoHS”).
- The declaration of conformity and our general standard terms and conditions can be obtained on our website at www.atmosmed.com.
- The quality management system applied at ATMOS has been certified according to international standards EN ISO 9001 and EN ISO 13485.
- Prior to start-up please peruse chapter 2.0 „For your safety“, in order to be prepared for any possible dangerous situations.

1.2 Intended use

1.2.1 Intended use of the ATMOS® E 201 Thorax

Name: ATMOS® E 201 Thorax

Main function: Digital device for mobile thoracic drainage

Medical indication/application:
Recovery of the neutral vacuum in the intra pleural cavity after the occurrence of a pneumothorax or a pleural effusion by drainage of air and secretion.
Drainage of secretion and air after a surgical opening of the thorax.

Specification of the main function:
The ATMOS® E 201 Thorax drainage suction unit is a digital device for mobile thoracic drainage. The device is meant for the short-term (< 30 days) application on humans. It is portable, grid independent and has an electronic monitoring system with optical and visual status displays. The device is applied unsterile. However, the tubing systems and the secretion canister[1], which have to be applied with the device, are sterile single use products. All thoracic catheter / drains can be applied, which are intended for thoracic drainage in the intended use of the manufacturer.

Application organ: Thorax

Application time: Short-term use on the patient (< 30 days)

Application site:
The application site is the clinical area. The application of the device may only be applied by healthcare professionals. The secretion canister and the drainage hose are sterile and disposable, and can be applied in the sterile OT area.

Contraindications:
No separate application of the canister and the hose system (this means without basic device) as gravity drainage.
No application in ambulances under emergency conditions and in the home care field which is not supervised by healthcare professionals.
No Suction of flammable, corrosive or explosive fluids / gases.

The product is: Active

Sterility: Not for the basic unit

Single-use product/reprocessing: Reprocessing for basic device

[1]Detailed information about the canister please see: Intended use and function secretion canister ATMOS® E 201 Thorax

1.2.2 Intended use of the secretion canister for ATMOS® E 201 Thorax

Name: Sterile secretion canister for the exclusive connection to the ATMOS® E / S 201 Thorax.

Main functions:
Forwarding of the created vacuum into the drainage hose and finally into the patient side drain.
Collection of the exhausted secretion.

Med. indications/ application: Secretion canister for the connection to a digital device for mobile thoracic drainage.

Specification of the main function:
The vacuum generated by the pump evacuates air and secretion out of the drain. The secretion is collected in the secretion canister whose filling quantity is 2 l. A bacterial filter prevents the potential contamination of the room and the device by bacteria. Additionally it prevents the accidental intrusion of secretion into the pump head. A sterile tubing system provides the vacuum for the patient side drain. A direct connection to the patient doesn't exist. With the support of the test measuring hose inside of the tubing system, which is also provided with a filter, the actual vacuum on the drain will be measured. Furthermore the measuring hose is also responsible for the flushing of the secretion hose with atmospheric air.

Application organ: Thorax

Application time: Short-term use on the patient (< 30 days).

Application site: Application environment is a clinical area. The application of the canister may only be applied by healthcare professionals. The secretion canister and the drainage hose are sterile and disposable and can be applied in the sterile OT area.

Contraindications: No application of the canister with other low vacuum devices than ATMOS® E / S 201 Thorax.

The product is: □ active X not active

Sterility: Sterile

Single use product / reprocessing: Sterile single use product

1.3 Warnings:

- Patient hose clamp must remain open during drainage operation.
- The device is not for use while bathing, showering nor suitable for a hazardous explosive environment.
- Do not use this device in MRI (Magnetic Resonance Imaging).
- Do not dry the device with microwaves.
    - Chest hoses should not be clamped except when changing the canister. In the event of an airleak, clamping chest hoses could lead to a tension pneumothorax.
- The ATMOS® E 201 Thorax must remain in an upright position during use.
- The patient should be regularly monitored according to internal hospital guidelines.
- ATMOS® E 201 Thorax is a medical device that requires special safety precautions and must be installed and placed in operation in accordance with the attached EMC information. Portable and mobile RF communication devices (mobile telephones) can affect the drainage system.
- A replacement device must always be available for patients for whom a breakdown of the device can lead to a critical situati on.
    - Do not separate patient hose in-line connector prior to clamping off patient hose first.
    - Do not keep patient hose clamp closed during drainage collection or patient transport.
- Please note that when the set pressure is -50 mbar or higher this high pressure can cause pain or injuries to the patient.

1.4 Precautions

- Federal (U.S.A.) law restricts this device to sale by or on the order of a physician.
- Canister and hose set are for single patient use and for one time patient connection only.
- Do not resterilize this device. Canister and hose are single-use products, there is a high risk of infection in case of re-use. The canister cannot be emptied ②
- Air vent must remain closed at all times when not in use.
- All hospital protocols for disposal handling and infection control should be carefully followed.
- The function of the device must be checked prior to use (see chapter 3.0 – Setting up and starting up; section 3.3 Functional test)
- When a thoracic catheter is connected leaky connections may result in an incorrect evaluation of air leaks from the lung and delay treatment time. Therefore check that all the connections are airtight to prevent air from entering from the atmosphere.
- During set up, an incorrectly positioned drainage system and patient hose may impair fluid and air evacuation. Total obstruction of fluid and air evacuation can cause an increase in positive pressure and possible tension pneumothorax. Therefore position the drainage system below the level of the patient`s chest and check that the patient hose does not form loops or kinks, impairing drainage of fluid and air.
- Check that all the connections are airtight. If the thoracic drainage unit tips over it is advisable to set it up right again to guarantee operation and to be able to re-determine the volume and appearance of the drained fluid. If there is the slightest uncertainty about the operation of the drainage system after it has tipped over, it is recommended that a new drainage system is being installed to ensure the patient`s safety.
  - Keep the AC adapter connector away from moisture.
  - Keep the power cord away from hot surfaces.
- Do not overfill water seal above the 2 cm fill line.
- Water seal must be filled to prescribed level prior to use and should be checked regularly to confirm proper operation.
- Use only pre-packaged sterile fluid for filling the water seal.
- When **inspecting the collection chamber routinely** check the volume and appearance of the drained fluid and inform the responsible clinician of abnormalities. Exceeding the recommended collection volume can cause obstruction of fluid and air evacuation and may therefore result in an excess pressure pneumothorax. Always replace the canister when the maximum volume is reached to ensure the patient‘s safety. Replace chest drain if damaged. Patient hose connections and water seal, should be checked regularly to confirm proper operation.
- Installation. The product must be used at room temperature and should not be placed in direct sunlight as this may result in measurement errors.

In case of noncompliance and misuse of the ATMOS® E 201 Thorax any guarantee claims shall expire and ATMOS Medizin-Technik GmbH & Co. KG assume no liability.

1.5 Function

The ATMOS® E 201 Thorax is a particularly useful small suction unit. The device is operated by an electromotive, maintenance-free piston pump. During operation the pump creates a vacuum in the hose system and in the collection jar, with the help of which secretions can be sucked through the set of hoses.
The pump switches off after creation of the vacuum and then switches on again when the vacuum lies below a certain figure. The real-time measured flow is shown as numerical value. The secretion is collected in the collection jar, the capacity of which is 2l. The vacuum at the trocar is measured by means of the measuring pipe in the set of hoses. The final vacuum can be adjusted with the buttons on the operating foil. If required, the air-flow rate is automatically adjusted. The device adjusts and keeps the pre-adjusted vacuum automatically in case the negative pressure in the pleural cavity varies. In this case the pump starts to balance the negative pressure until the pre-adjusted vacuum is reached again and then switches off. These compensation values, which may vary heavily, can easily be read on the display. At regular intervals the device rinses the suction hose with air so that deposits in the suction hose are avoided and it prevents secretion from penetrating the measuring channel.
The device is fitted with a rechargeable battery. A microprocessor controlled electronic charging unit in the suction device guarantees the safe charging of the battery, and thus overcharging of the battery is avoided. In addition a bacterial filter located in the cover of the collection jar prevents the entry of bacteria and secretion into the interior of the device.
There is a carrying strap available for mobile use. A practical carrying bag and a bed mounting are accessories that can be ordered.

1.6 Explanation of pictures and symbols

Short cuts / symbols contained in this manual

Follow the arrows whilst proceeding, sequence

Please press where the dot indicates

Please read, important information

■ General information

● Numeration

→ Subnumeration

Check

Move, plug ... in this direction

Turn, shift ... in this direction

Replace

Engage, check correct fit

Pictures contained in this manual

Warning, special diligent notice!

☞ Important information

Operating keys / symbols of the ATMOS® E 201 Thorax

ON = short keypress (supply, connection to mains)

OFF = long keypress (supply, disconnection from the mains)

Adjustment keys ▲▼

Reset / Enter

This product is not re-sterilisable. Repeated reuse of components which are marked with a ⓧ is forbidden. In case of repeated reuse these components lose their function and there is a high infection risk.

Application part type CF, defibrillator-proof, recovery time 10 sec

SN Serial number

REF Order number

Manufacturing date

CE 0124 The CE sign shows that this product meets the appropriate requirements of the EC guidelines.

Protection class II

Fuse

Please observe operating instruction!

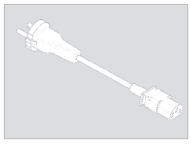
Sterile unless package is damaged or open

1.7 Scope of supply

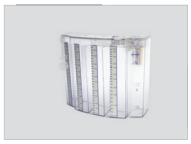
- Prior to dispatch, this ATMOS device was subjected to an extensive functional test and has been carefully packed. Nevertheless, please compare the contents of the shipment on completeness immediately upon receipt (see delivery note).

Basic device

Hose set, sterile packed (Must be ordered separately!)



Power cord



Canister set sterile packed (Must be ordered separately!)

Operating instructions

1.8 Transport and storage

- The transport of the device may be effected only in a dispatch carton upholstered and offering sufficient protection.
- Please document and report damages in transit immediately. For complaints or return deliveries, please use the enclosed form **QD 434**.
  The form QD 434 can also be downloaded from the internet www.atmosmed.com.
- The unit must be allowed to stand for up to six hours at room temperature prior to starting up for the first time following transport at temperatures below freezing. The unit **may not** be operated if it has **not** acclimatised as this might damage the aggregate.
- Ambient conditions:

Transport/Storage:	-10...+50°C; 30...95 % air humidity non-condensing at air pressure 500...1060 hPa
Operation and battery charging:	+10...+35°C; 30...95 % air humidity non-condensing at air pressure 700...1060 hPa

2.0 For your safety

For your safety

- The ATMOS® E 201 Thorax is designed in accordance with IEC 60601-1/EN 60601-1. It is a device which meets the VDE protection class II. It may be connected to a properly installed wall power point socket.
- Before commissioning the device, drainage canister, mains cables, accessories, connecting leads and hoses should be checked for damage.
  Damaged leads and hoses must be replaced immediately. **The function of the device should be checked prior to use.**
- The ATMOS® E 201 Thorax may only be used by trained specialist staff.
- The ATMOS® E 201 Thorax is not designed for operation within areas **where there is a risk of explosion** and in oxygen rich environments. Areas that are at risk from explosions can arise due to the use of combustible anaesthetics, skin cleaning and skin disinfecting materials.
- No liquid may enter the device. If liquid has entered the device it must be checked by the customer service before it is used again.
- After a long journey at temperatures under the freezing point the device must be allowed to stand for up to six hours at room temperature before it is used for the first time. If the device is not acclimatised, it must not be operated, since the piston of the unit might be damaged if it runs in this condition.
- Only trained staff may remove the canister from the device during therapy.
- Prior to use the perfect function of optical and acoustic alarm must be checked by the user.
- For hygienic reasons we recommend to exchange the hose always together with the canister.
- Uncoupling of the device may only be performed if the maximum target value of 15 mbar is reached.
- Disinfectant should not enter the device. If disinfectant has penetrated the device, then it must be dried thoroughly and subsequently an efficiency control must be conducted. It must be both checked, whether the target vacuum is reached when the system is closed and whether a flow >10 l/min is reached after a while when the system is open. If not, the device must undergo a service check prior to being used again.
- Dispose of the packing material in a proper manner.
- Before the device is connected a check must be made to see that the mains voltage and mains frequency given on the device agree with the values of the supply system.
- Only regular and undamaged mains connection and extension cables must be used.
- The suction hose must not come directly into contact with the suction place but only through a sterile drain.
- To disconnect the device from the mains first pull out the plug from the wall socket. Only then disconnect the connection cable from the device. Never touch the plug or cable with wet hands.
- The environmental conditions given in the technical specifications (section 9.0) must be observed.
- The control panel should always be clearly in view for the operators and be easy to reach.
- The ATMOS® E 201 Thorax meets the resistance to jamming of the standard **IEC 60601-1-2/EN 60601-1-2** „Electromagnetic compatibility - Medical electrical devices“.
- No guarantee claims can be accepted for damage which is produced by using third party accessories or third party consumable materials.
- ATMOS is not responsible for damage to people or goods if
  - non-original ATMOS parts are used,
  - the information in these operating instructions are disregarded,
  - assembly, new installations, modifications, extensions and repairs are done by people who are not authorised by ATMOS.
- These operating instructions correspond to the design of the device and the situation of the safety standards on which they are based when they were printed. The circuits, processes, names, software programmes and devices are all covered by patents.
- Please only use ATMOS canisters with integrated bacteria filter and ATMOS hoses with integrated bacteria filter in the measuring channel.
- The canister may not be used without device.
- This product is not re-sterilisable. Repeated reuse of components which are marked with a ⓧ is forbidden. In case of repeated reuse these components lose their function and there is a high infection risk.

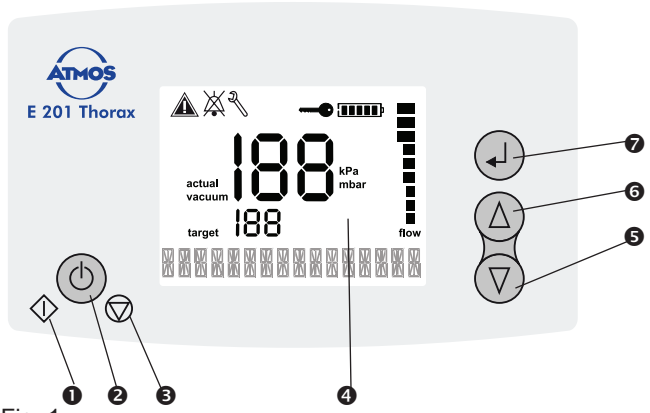


Fig. 1

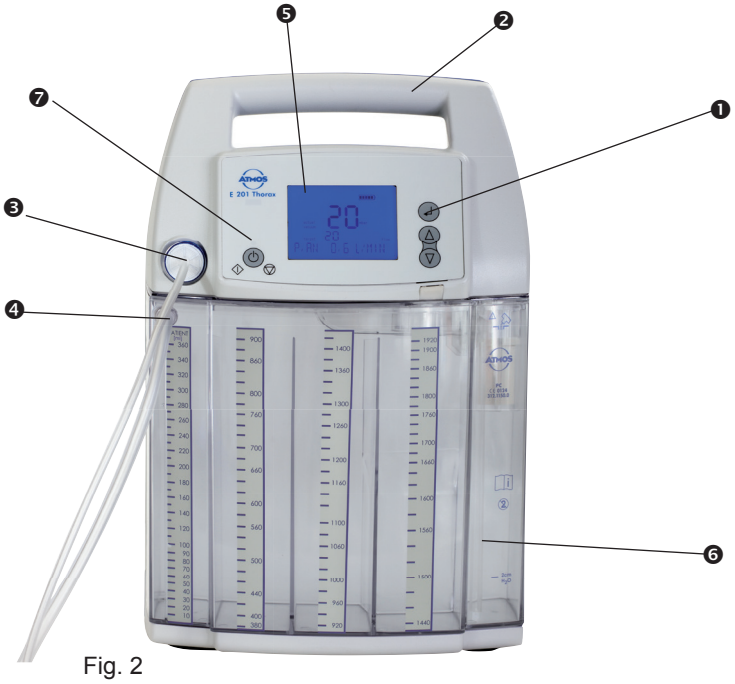


Fig. 2

3.1 Setting up

- Set up the device on a level, firm surface.
- Connect the mains cable for charging the battery.

Mains voltage and fuse:

Mains voltage: 100-240 V; 50/60 Hz
Fuse: 1 x T 1A, L

- USA/ Canada:
  Use only „Hospital Grade“ mains plugs and cords with remark: Grounding reliability can only be achieved when the equipment is connected ...). Cord type shall be SJ-type and not smaller than 18 AWG and should comply with CSA C22.2No.21.
- Australia:
  Use only cards with plug Type AS 3112.
- Singapore:
  Plugs shall be rough-use-type, marked with „SS 145/A“.
- Denmark:
  Plugs and sockets shall appply SB 107-2-D1, 3rd Edition
  Plugs: DK 2-Ia, DK 2-Ia with flat phone pin or DK 2-5a, socket outlets: DK 1-3a.

3.1.1 Display / operating keys

❶ Start pump
❷ On/off switch
❸ Stop pump
❹ Display
❺ ▼ Adjustment key
❻ ▲ Adjustment key
❼ Enter / Reset / Menu

3.2 Starting up

❶ Operating panel
❷ Handle
❸ Measuring channel
❹ Suction channel
❺ Display
❻ Secretion canister
❼ Device status (LED)

- Lift the unit out of the cardboard. Check whether the voltage values on the data plate correspond with the inbuilding voltage.
- Set up the device on a level, firm surface.
- Prior to first operation, pay attention to the safety information in chapter 2.0.
- Prior to first start up the battery must be fully charged. Charging time approx. 2.5 h.
- The unit must be allowed to stand for up to six hours at room temperature prior to starting up for the first time following transport at temperatures below freezing. The unit may **not** be operated if it **has not** acclimatised as this might damage its piston.
- The device can only be operated with the special ATMOS canister, therefore please take care to have at least one spare canister available.

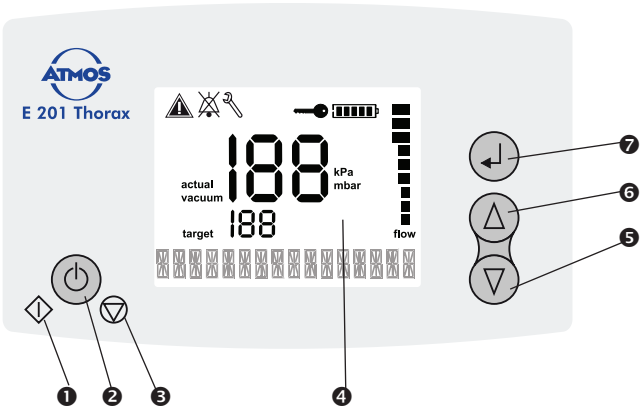


Fig. 3

3.3 Functional test

- Mounting of the ATMOS® E 201 Thorax as described under Fig. 2.
- Before use the system must always be tested regarding impermeability.
- Slip on the test hose set to the device and connect the patient side of the hose to the sealing cap (blue plastic part) at the secretion canister. Use gloves!
- Start the device pressing the key ❸. A leakage test is performed automatically by the device. Please press Enter ❼ to continue.
- The permeability can be checked over a longer period when the device has reached the standard screen (Fig. 8). Switch the pump on „P. ON“ by briefly pressing button ❷ ⟹ when the target vacuum is achieved, switch the pump off „ P. OFF “ by again briefly pressing button 4. The actual vacuum should not fall by more than 12 mbar within 10 secs when the hose end is closed.
- In case the leakage test was successful Fig 4 appears on the display. Please confirm with key ❼ (Fig 3).

Display readout:

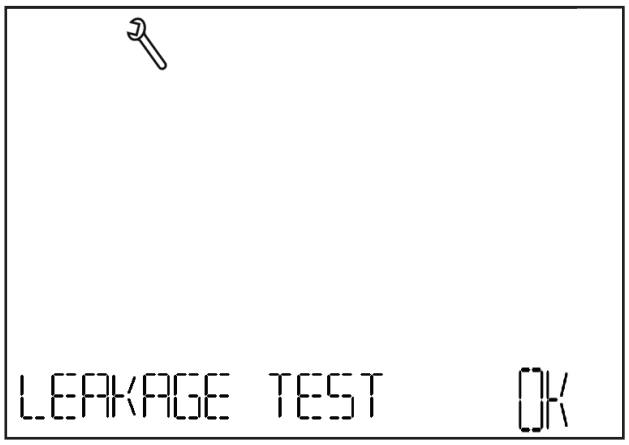


Fig. 4

- If the leakage test was not successful, please switch off the device and check all the connections (hose, canister, etc.). Restart leakage test in starting up the device.
- If need be re-establish permeability (Check hose connections).
- Switch over to standard mode ⟹ ensure the pump is off („ P. OFF “).

Please pay attention to the period tests in chapter 6.0 „Service and maintenance“ on page 20.

Important notes on safety for the secretion canister system

- **Only use the original ATMOS single-use secretion canister!**
- **For hygienic reasons we recommend to exchange the hose always together with the canister.**
- **Vacuum connection**
  The vacuum connection between the pump and the collection jar is created automatically as soon as the secretion canister jar is positioned correctly.

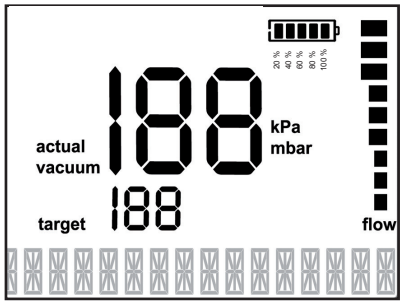


Fig. 6

4.1 Adjust vacuum

Adjust the target vacuum with the keys ▼▲.
The basic setting is -20 mbar. This value can be changed in the settings menu.

Depending on the selected vacuum unit, the target vacuum can be set in 1mbar or 1kPa steps.
NOTE: 1kPa = 10mbar, therefore when kPa is selected, the vacuum range is 1kPa to 10kPa.

4.2 Suction procedure

- After setting the target vacuum the drainage system builds up and controls the set negative pressure automatically as long as the pump is switched on.
- The bacterial filter is a safe protection against liquid penetrating the pump.

4.3 Hose rinsing

An automatic hose rinsing function will operate periodically. This rinsing function is designed to draw any secretion or fluid build-up in the measurement hose into the suction hose and subsequently the secretion canister.

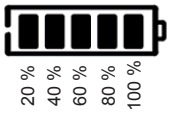
If the water lock function is being used, air bubbles are likely to appear during the hose rinsing period. Users should be aware that these air bubbles that appear at regular intervals (usually 5 mins), are not related to the patient’s condition (e.g. fistual).

The hose irrigation is inactive if the actual vacuum value is between -10 and 0 mbar.

4.4 Battery recharging

The battery is recharged by the integrated recharging electronics as soon as you connected the device to the mains supply with the power cord. Please note the information on how to handle rechargeable batteries in chapter 6.3.

Charging condition:



Please take care not to expose the device to any source of heat during recharging as this would reduce the available charging capacity and increase the recharging period.

Correct handling of the rechargeable batteries prolongs their maximum service life.

Rechargeable batteries are wearing parts and therefore excluded from the 2 years‘ product liability!

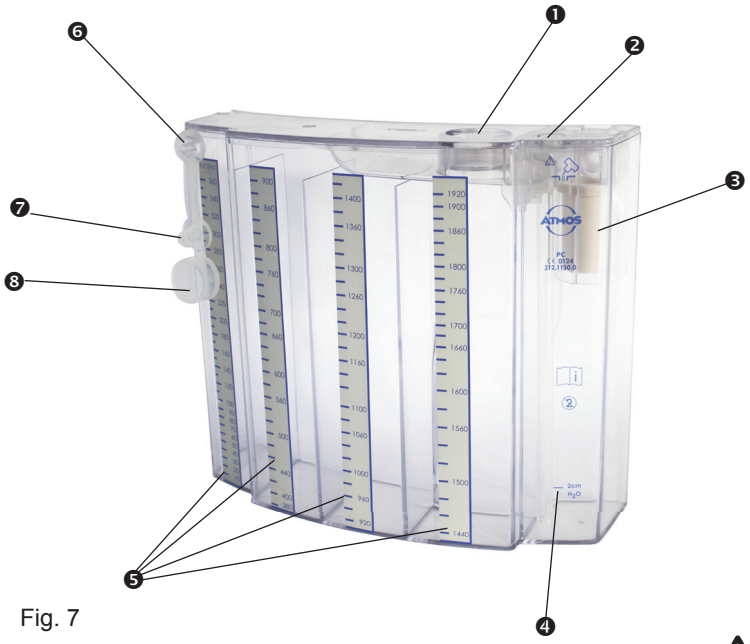


Fig. 7

Fig. 8

Fig. 9

4.5 Canister

1. Pop-off valve
2. Filler for water lock
3. Hydrophobe bacterial filter
4. Filling level for water lock function
5. Indicator scale for balancing in ml
6. Connection towards patient (secretion channel)
7. Protective cap for sealing the secretion channel
8. Protective cap for sealing the pop-off valve

4.5.1 Filling the water lock

The water lock is on the right side of the canister. A bacteria filter and a riser are included. The water lock is filled with water through the riser. For filling the water lock a sterile cannula 20 G, a sterile syringe and 50 ml sterile water are required. With the cannula you may puncture the silicone seal above the riser and then fill the water lock. Repeat this procedure until the water lock is filled up to the 2 cm filling mark.

Reconnect the filled canister to the device as described under 4.5.3

⚠ During normal operation the filling of the water lock is optional.

⚠ The canister may only be removed when the pump is switched off.

⚠ **Prior to inserting the secretion canister into the device, make sure that the filler of the water lock is sealed with the plug.**

4.5.2 Pop-off valve

The pop-off valve releases in case of overpressure (e.g. coughing fits) ❶.

4.5.3 Insertion of the canister

Connect the filled canister to the device.
Insert the new canister (fig 9). Insert the rear left edge of the canister in an angle of approx. 30° to the housing wall and move the canister to the left until it engages. Then move the canister towards the housing until it clicks into place (Fig 10). The ATMOS® E 201 Thorax is again ready for use. Reopen the clamp at the suction hose.

4.5.4 Hose holder at the canister

Please reorder the hose holder under REF 312.1029.0. Pull off the adhesive strip and fix the holder as shown in Fig 11.

Fig. 10

4.6 Connect hose set

❶ Measuring channel
❷ Suction channel
❸ Sealing cap for closing the secretion channel

Protective cap for sealing the secretion channel, see chapter 4.5.3 ❼ Insertion of the canister.

Measuring channel:
Attach the luer-lock connection with integrated filter to the measuring channel and turn it to the right.

Suction channel:
Attach the luer-lock connection to the measuring channel and turn it to the right.

The vacuum is measured directly with the measuring channel at the drain. A bacterial filter prevents the measuring channel from contamination with bacteria and the penetration into the device. The secretion is sucked off through the suction channel.

A double-lumen hose system is indispensable! Both hoses must be connected. The hose set is a single-use product for use with one patient only.

When using other hose systems this may lead to damage of the device.

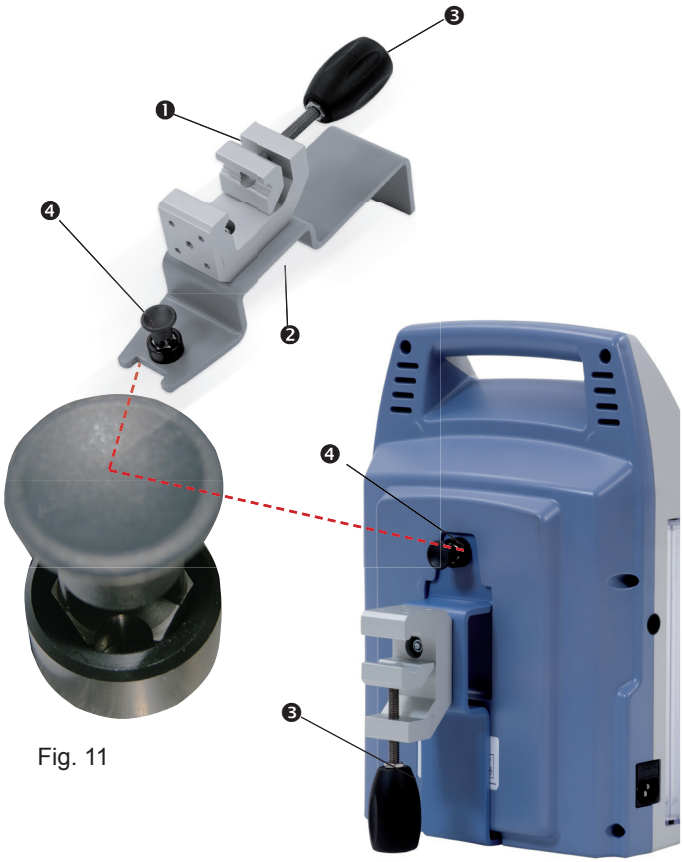
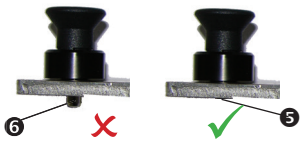


Fig. 11

4.7 Universal fastening (optional)

The fastening can be mounted to infusion tripods, wheelchairs, to the bed or to the standard rail. Arrest the adjusting lever ❶, hereto please pull out the pin ❷ and rotate the adjusting lever ❶ up to the required position (in 90° steps) until the pin ❷ engages automatically. Fix the adjusting lever ❹.

Please take care that the screw is screwed in prior to put the ATMOS® E 201 Thorax onto the support!



Put the ATMOS® E 201 Thorax onto the support.

Slightly pull out the upper button ❸ and rotate it by 90° until the two connectors ❹ are at the level of the holes ❺ and then release the button.

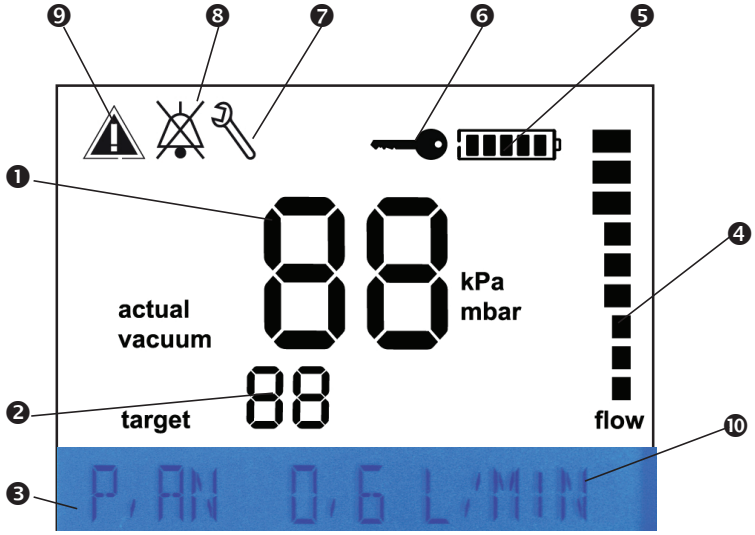


Fig. 12

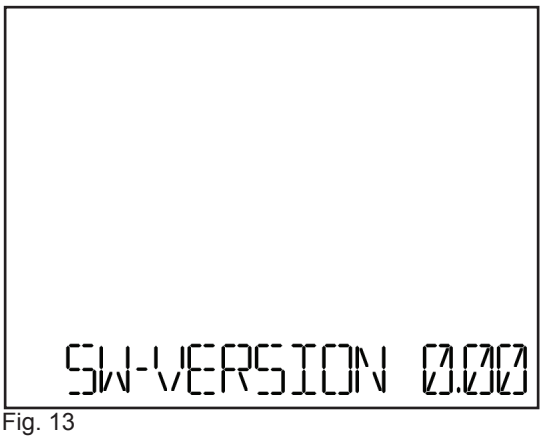


Fig. 13

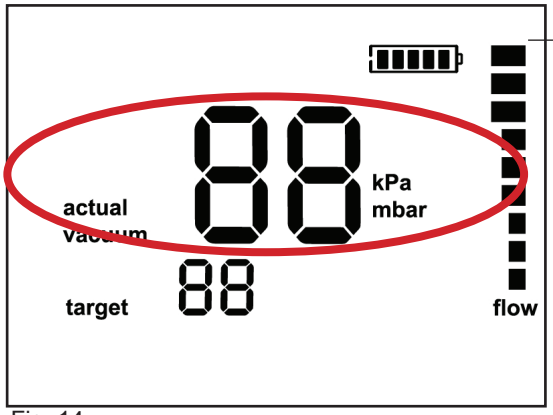


Fig. 14

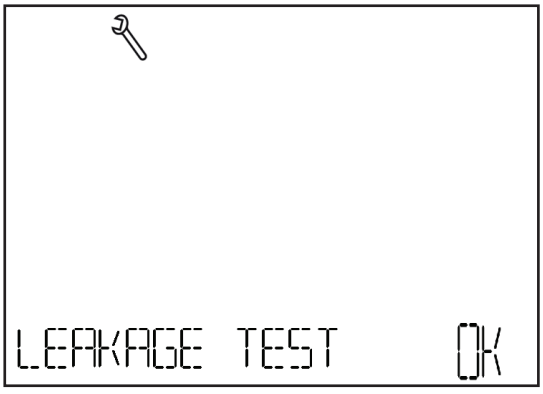


Fig. 15

4.8 Information on the display

❶ Actual vacuum
❷ Target vacuum
❸ Text line
(eg. pump on or off)
❹ Display of airflow
❺ Battery status
❻ Key lock
❼ Service display ⇨ Please call service
❽ Alarm signal is suppressed
❾ Alarm symbol
❿ Actual flow

4.9 Display functions

4.9.1. Switch on

Switch on the ATMOS® E 201 Thorax with the
I/O key.

The start screen is shown for 2 seconds.

Visualized flow display.:
Each additional bar represents an additional flow.

From 1 to 3:	0,25 l/min (small)
From 4 to 6:	0,25 l/min (medium)
From 7 to 9:	3,80 l/min (large)

4.9.2 Adjusting the vacuum

Adjust the target vacuum with the keys ▼▲.
The basic setting is -20 mbar. The last selected value is stored and is adopted as the target value during the next start up of the device.

Depending on the selected vacuum unit, the target vacuum can be set in 1mbar or 1kPa steps.
NOTE: 1kPa = 10mbar, therefore when kPa is selected, the vacuum range is 1kPa to 10kPa.

4.9.3 Leakage test

⚠ Perform a leakage test (see chapter 3.3). If the leakage test failed, please repeat the test.

Only exit this menu when you wish to start the therapy.

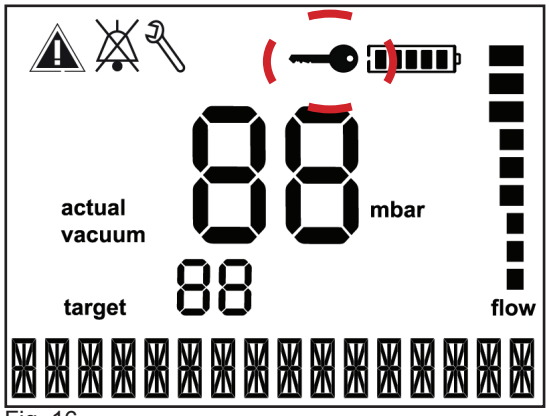


Fig. 16

4.9.4 Keylock

For manual activation of the keylock, please press keys ▲ and ▼ simultaneously until the keylock symbol is displayed on the screen.

After switching on of the device the keylock is automatically activated if no key is operated within the preselected period. The period for activation can be adjusted in the settings menu between 1 ... 20 min (see chapter 4.9).

If the key ock is activated, the key symbol is shown on the display. For deactivation, please press the buttons ▲ and ▼ simultaneously until the keylock symbol is no longer displayed on the screen.

Fig. 17

4.9.5 Exchange of the canister

Uncoupling of the device may only be performed after pinching off the hose and if a target value of 15 mbar is reached.

Briefly press the I/O key, the pump stops. The symbol ⏸ appears. Pinch off the hose near to the patient. Close the suction hose close to the patient using a clamp in order to prevent from loss of vacuum.

Press the release button ❶ and swivel the canister system forward until the canister can easily be removed from its guides ❷. Disconnect the canister from the hose system and the secretion channel. Seal the secretion channel and the pop-off valve with the protective caps (see chapter 4.5).

First seal the port for the patient hose. Remove the cap of the pop-off valve by rotating and tearing it away. There is no need to seal the connection to the device because the bacterial filter is covered with a self-sealing coating.

Please wear gloves. Dispose of canister separately.

Insert the new canister (fig 17). Insert the rear left edge of the canister in an angle of approx. 30° to the housing wall and move the canister to the left until it engages. Then move the canister towards the housing until it clicks into place. The ATMOS® E 201 Thorax is again ready for use. Start up the pump by pressing the I/O key. Reopen the clamp at the suction hose.

Exchange the canister at the latest when a filling level of 1900 ml is reached.

4.9.6 Switch off

To switch off the device, press the I/O button for 3 seconds.

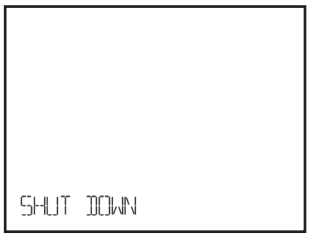


Fig. 18

4.10 Settings menu

With a long depress of the menu key ↵ (3 seconds) you can enter the settings menu. The first activated dialog box is „language“. By pressing the ▲ or ▼ key you may switch from one dialog box to the next. You activate the setting in pressing the enter key. You select the requested setting within the dialog box in pressing the ▲ and ▼ key and confirm the setting in pressing the enter key again. You may then switch to the next menu item with the ▲▼ keys. If all settings are made, exit the settings menu in depressing the menu item „exit“ and confirm with the enter key ↵ on the display. Your settings are also saved after switch off of the ATMOS® E 201 Thorax.

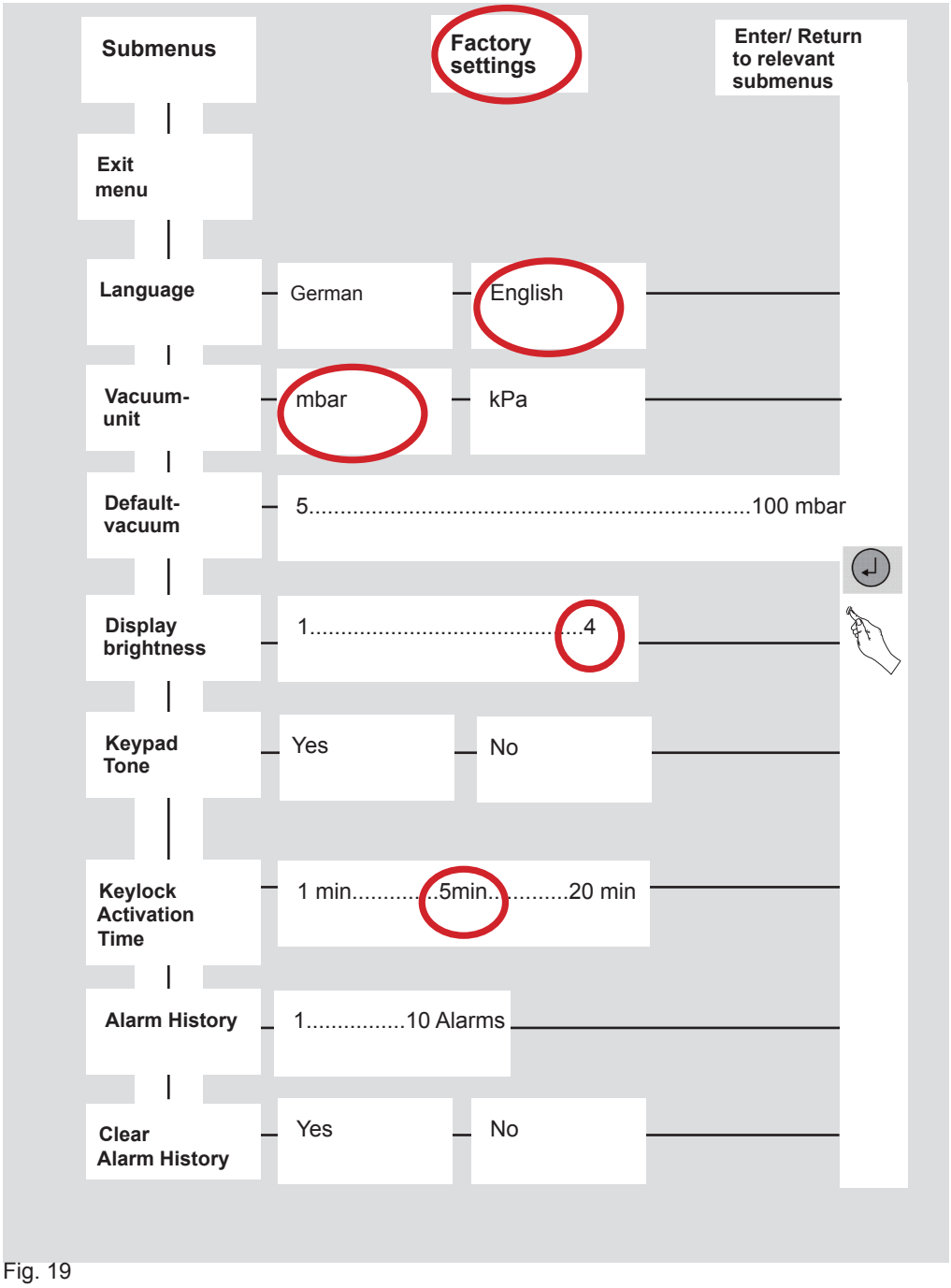


Fig. 19

4.11 Alarm

The key lock is automatically deactivated if the alarm is activated!

Prior to starting up the device the correct function of the visual and acoustic alarm must be checked by the user. In case of alarm the system switches automatically to the alarm menu. An error message is displayed. Below an information on how to solve the problem is shown. Simultaneously the acoustic alarm is activated. The LED is illuminated in orange or red.

Before the device can be used, the correct function of the optical and acoustic display must be checked by the user.
Perform the following steps:

1. Attach a canister on the ATMOS® E 201 Thorax.
2. Connect a hose to the unit.
3. Turn on the power.
4. Perform the leakage test.
5. After passing the leakage test, adjust a target-vacuum of 20 mbar or -2.0 kPa.
6. Ensure that the end of the connected hose set (connection point for drainage) is open - the pressure in the tank-hose system corresponds to the ambient pressure.
7. Leave the unit for more than 10 minutes in the ON state without starting a vacuum therapy.
8. Wait until the device detects a permanent low vacuum and a corresponding alarm sounds.
9. Check that the display shows an alarm message.
10. Check that an audible alarm signal sounds.
11. Check that the status LED blinks red.
12. If you have performed all the above steps successfully, the correct function of the optical and acoustic displays is sufficiently controlled.

If you have done all the above steps successfully, the correct function of the optical and acoustic indication is sufficiently controlled.

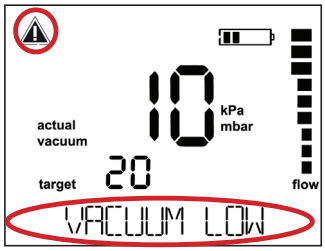


Fig. 20

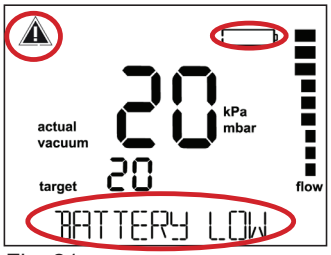


Fig. 21

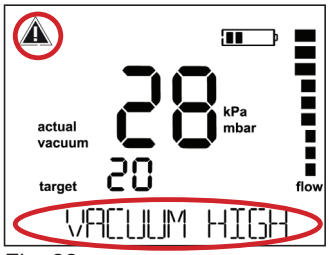


Fig. 22

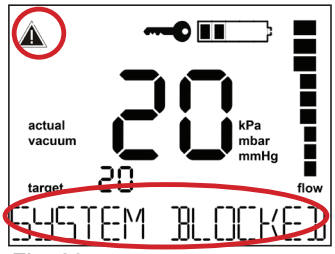


Fig. 23

In order to suppress the alarm in case of alarm signalling, please press the ↵ key.
The alarm continues to be displayed until the condition for the alarm is resolved (eg. target vacuum achieved, battery recharged).
If required, briefly press the I/O key to turn off the pump „P. OFF“.

The cause of error must always be cleared in case of any alarm message!

Display	Cause of defect	Troubleshooting
Vacuum low	In case the final vacuum cannot be reached an acoustic and optical alarm is released and „vacuum low“ is readout. Possible cause for this error message: Leakage, blocked bacteria filter or any blockage in the measuring channel or secretion in the pump.	Check connections and hoses.
Vacuum high	When an excessive vacuum is measured the „vacuum high“ alarm is activated (acoustic and optical).	Check the hose system.
Battery low	In case the battery voltage falls below a certain value the alarm signal (acoustic and optical) for „battery low“ is activated.	Connect the device to the mains, battery is recharged and charging condition is displayed.
System blocked	The information that the system is blocked is activated.	Check the hose and in case the filter is blocked, exchange the canister with the filter.

Further alarm displays you will find in chapter 7.0 Trouble shooting.

5.1 General information on cleaning and disinfection

Before cleaning

Medical devices must always offer a maximum in safety and function.
We therefore recommend:

Prior to each application:

☞ The described measures to clean and to disinfect or sterilize do not replace the instructions given in the particular company!

- All disinfects used to disinfect ATMOS® E 201 Thorax have to be legally marketed disinfectants.
- The secretion canister and the hose set are single-use products and may not be reprocessed.

☞ Always observe the concentration specifications and instructions by the respective manufacturer!

5.2 Cleaning the device surface

If liquid has penetrated the unit, it may not be operated again until it has been checked by the authorised customer service centre. Please note that disinfectant should not enter the device. Do not use a spray disinfectant directly on the device, but spray it on a cloth (only damp not wet). During cleaning and disinfection the device must be switched off. It may only be switched on again if cleaning agents and disinfectants on the device surface are fully dried.

Disconnect the power cord from the mains prior to cleaning and disinfection of the device surface.

- The unit itself can be wiped off with a moist (not wet) cloth.
- The surfaces of the ATMOS® E 201 Thorax can be cleaned / disinfected with products of the following active ingredients:
  - QAV (quartanary ammonium compounds)
- Do not use
  - Disinfectants containing concentrated organic or anorganic acids or bases, since these may cause corrosion damages.
  - Disinfectants containing chloramides or phenol derivatives since these may cause stress cracks in the material used for the housing of the unit.

Discolouration may result if disinfectants containing aldehydes and amines are used on the same object.

6.0 Maintenance and servicing

6.1 Basic information

- Carry out a visual inspection of the unit prior to each use including hoses, collection jar and connection cable. **Damaged cables and hoses must be replaced immediately.**
- Maintenance, repairs and period tests may only be carried out by persons who have the appropriate technical knowledge and are familiar with the product. To carry out these measures the person must have the necessary test devices and original spare parts. ATMOS recommends: work should be carried out by an authorized ATMOS-service partner. This ensures that repairs and testing are carried out professionally, original spare parts are used and warranty claims remain unaffected.
- Carry out an inspection according to the manufacturer's specifications every 12 months (Germany: safety check according to §6 Medical Device Operator Ordinance).
- For repair, this device can be returned to ATMOS.
- Before returning the device for repair, it must be thoroughly cleaned and the surfaces must be disinfected. Please send in the device without canister and hoses because for hygienic reasons they would be disposed of during repair.
- ATMOS cannot guarantee perfect functioning neither will it be liable for damage to people or property if:
  - any non-original ATMOS parts are used,
  - the user instructions given in this manual are not followed exactly or are disregarded,
  - assembly, resetting, alterations, extensions and repairs are not carried out by people authorised by ATMOS.
- No warranty rights shall exist in the event of damage or failure caused by the use of non-ATMOS accessories or non-ATMOS consumables.
- When the operating instructions stated in this manual are observed there is no health hazard. Nevertheless, we recommend, depending on the type of application, the hygienic reprocessing of the device within the scope of the inspection according to the manufacturer's specifications at least once a year.
- Pay attention to regulations and instructions valid for the respective application range.

6.2 Reprocessing

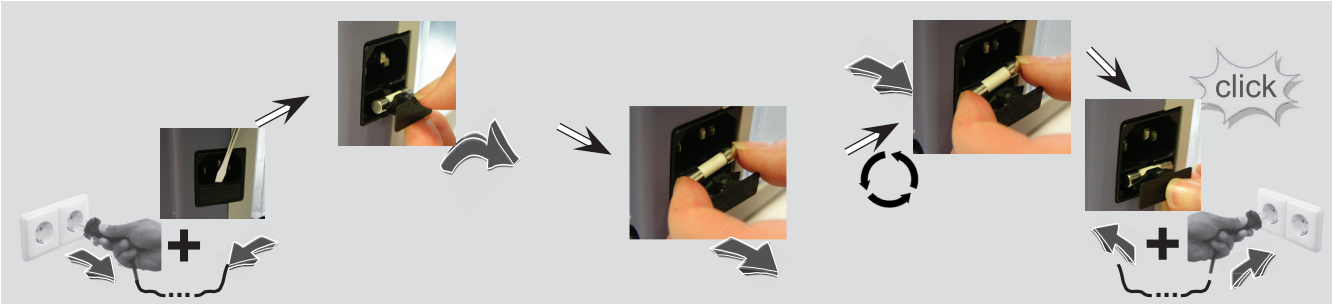
The way the suction device is used determines its reliability and safety. These hygiene measures described in the last chapter are indispensable for protecting the patient and the user and for maintaining a safe and reliable suction device.

These measures are no substitute for a reprocessing of the device by the manufacturer or by a specialist authorised by ATMOS. The device should at least be reprocessed every 12 months.

6.3 Battery handling

- Prior to first use, the battery must be fully charged!
- Deep discharge may destroy the battery. Therefore, please fully recharge the batteries of the ATMOS® E 201 Thorax every 3 months, even if the device is not used.
- Battery-run devices should only be stored when they are fully charged.
- If the device was not in operation for a long period of time, the full capacity of the battery can only be achieved when 4 complete recharging and discharging cycles have been completed.
- Used batteries should be replaced immediately by the customer service. The mains operation of the device with used batteries can destroy the charging electronics respectively excessive power consumption of the device may result in a spontaneous cut-off.
- Heat destroys the batteries. Therefore, please prevent them from direct solar radiation and keep them away from radiators. The perfect storage temperature is between 8 – 15°C.
- The battery should be exchanged by the service department if the available capacity (operating time) is less than 80 % compared with a new battery.
- Conditional of manufacturing batteries are run-down after approx. 800-900 charging cycles.
- Batteries are consumables.

6.4 Exchange of fuses



7.0 Trouble-shooting

Description	Possible reasons	Measures
Device cannot be switched on	Battery is fully discharged	Connect the mains cable and recharge the battery; see the charge level indicator in the display on the left
Battery cannot be recharged, symbol for mains connection does not appear in the display although the mains cable is plugged in	Fuse is defective	Check device fuse and in-house fuse
	Mains cable is defective or not plugged in correctly	Check the mains cable
	Internal power supply or battery is defective	Device must be checked by the authorised service
„Vacuum low“	Any leakage	Check all the hose and canister on any leakage
	Blockage in the hose set	Possible blockage must be eliminated; the measuring channel must be removed briefly from the canister lid; in case the filter in the measuring channel is blocked, the hose set must be exchanged
	Filter / overflow safety is blocked	Hose and filter must be checked, if the filter is blocked, the canister including filter must be exchanged
	Secretion has penetrated the aggregate	Device must be checked by the authorised service
„Vacuum high“	Excessive vacuum is fed from outside	Check correct hosing
„Battery low“	Battery is flat	Connect the device to the mains; battery is recharged and the charge level indicator is shown in the display on the left
„System blocked“	In the display it is shown that the system is blocked	Check the hose and if the filter is blocked, the canister including filter must be exchanged.
System is shutting down	Battery is empty	Connect the device to the mains; battery is recharged and the charge level indicator is shown in the display on the left
High temperature		Please provide sufficient cooling
Device overheated		Contact ATMOS Service
Leakage test failed	Internal error	In case of any leakage during the automatic leakage test, the device must be checked by an authorized service engineer.
Flow readout is always 0 l/min	Component error	1) Please check whether the flow is also 0 l/min when the system is open. 2) Device must be checked by the authorised service
	Secretion has entered the device	
Service is required.	hardware / software fault	Contact ATMOS Service
Service is required. If necessary restart without mains connection.		Contact ATMOS Service. During a restart the error message appears every 30 seconds.

8.0 Accessories, consumables and spare parts

Accessories	REF
Universal bracket Bracket for fastening the ATMOS® E 201 Thorax on the patient bed, standard rail, wheelchair, tripod, etc.	**312.1160.0**
Consumables	
OT set	**312.1031.0**

In the surgical kit included:

Canister for ATMOS® E 201 Thorax
Disposable canister system 2 l, with hose-free connection to the drainage system
10 pieces

Drainage hose, sterile, L = 1.8 m, 10 pieces
Exchange: once per patient

9.0 Technical specifications

9.1 Technical specifications secretion canister for ATMOS® E 201 Thorax

Capacity	Max. 2000 ml
Canister	ATMOS disposable canister, transparent with integrated water lock, pressure control valve, classification acc. to DIN EN ISO 10079, max. capacity 2 l, connection to the device with plug and play system“, Material: PC Lexan 144R Resin
Further component parts	a) Pop-off-valve (silicone) b) Hydrophobic bacterial filter made of sintered PE
Weight	430 g
Dimensions H x W x D (max.)	214 x 280 x 96 mm (max.)
Packaging	Canister is covered with a PE-bag, wrapped in a printed PET/ PEbag with Tyvek-strips, Label for the identification of contents
Packaging unit	10 single wrapped canisters in a brown box, separately defined with an imprinted ATMOS logo! Label defined separately
Sterilization	In the VE described above on a palette with EO (Ethylenoxid)
Ambient Conditions Transport / storage	-20...+50°C 5...95 % humidity without condensation at an air pressure of 700...1060 hPa
Marking on the canister	CE-mark on the packaging CE 0124 For single use Pay attention to the package information leaflet
Classification acc. to annex IX EG-Guidelines 93/42/EWG	Is
CE marking	CE mark on the packaging CE 0124
GMDN Code UMDNS Code	37770 15-270

Issue of Technical Specifications: 05.05.2015

9.0 Technical specifications

9.2 Technical specifications hose system ATMOS® E 201 Thorax

Suction hose	ATMOS disposable suction hose for thorax, double-lumen, with an integrated bacterial filter in the measuring channel, 180 cm long, material: medical grade PVC (ModenPlast RB4 NDG)
Component parts	a) Hose double-lumen b) Adapter hose – nozzle c) luer-lock adapter suction lumen d) transducer protector e) funnel adapter f) hose adapter with sampling port g) end cap luer-lock sampling port
Material a) Hose double-lumen b) Adapter hose – nozzle c) luer-lock adapter suction lumen d) transducer protector - PTFE 1.0 µm e) funnel adapter f) hose adapter with sampling port g) end cap luer-lock sampling port	 PCV RO 1007 K20131 PVC-U RO 1051 K20108 PVC-U RO 1051 K20108 TP025AATR010AD01, GVS Housing: PVC NAKAN - ATA 21 Naturale (Resilia) PCV RO 1011 K20108 PP RO 1041 K20199 ABS TERLURAN® GP 35
Weight	119 g
Dimensions I.D. x O.D. x L	5,15 x 8,15 + 3,65 x 5,15 x 1800
Packaging	Hose system in sterile packing (Tyvec) Sealed seam 5 mm +/- 1 mm Label for identification of contents
Packaging unit	10 single wrapped hose systems in a brown box, separately defined with an imprinted ATMOS logo
Sterilization	In the VE described above on a palette with EO (Ethylenoxid)
Ambient conditions Storage	max. +40°C 30...95 % humidity without condensation at an air pressure of 700...1060 hPa
Classification acc. to Appendix IX EC Directive 93/42/EEC	Is
CE Marking	CE 0124
GMDN Code UMDNS Code	14191 16-779

Issue of Technical Specifications: 05.05.2015

9.3 Technical specifications ATMOS® E 201 Thorax

Voltage	100 – 240 V~, 50/60 Hz
Power consumption	Max 0.7 A
Power input	Max. 70 VA
Fuse	1 x T 1 A, Cut-off characteristic L
Built-in rechargeable battery	21.6 V, 2250 mAh, lithium-ionic cells connected 6S1P, size 18650
Further connection options	None
Other safety lugs	Pressure control valve „pop off“ in the canister Vacuum limitation in the device to approx. 150 mbar Acoustic and optical error warnings
Pump performance	Free flow 18 l/min +/- 2 l/min
Vacuum adjustment	Vacuum adjustable from -5 to -100 mbar, step size -1mbar
Display, backlit	Graphic display with readout of target vacuum and actual vacuum in mbar or kPa, current flow in l/min, various symbols and setting menus, language to be selected: German, English, French, Italian, Spanish
Operating time	Continuous operation, within the stated temperature range
Battery operation time at maximum continuous suction	1 h
Battery operation time at standard operation (without fistula)	12 h
Battery recharging time	Fully recharge (at least 95 %) in approx. 2.5 h
Earth leakage current	Max. 0.5 mA
Patient leakage current	Max. 0.01 mA
Ambient conditions Transport/storage Operation	-10...+50°C 30...95 % air humidity without condensation at air pressure 500...1060 hPa +10...+35°C 30...95 % air humidity without condensation at air pressure 700...1060 hPa
Dimensions HxWxD	Approx. 365 x 250 x 168 mm
Weight	2.7 kg device without canister 0.6 kg canister
Material of housing	ABS/PC UL 94 V0, grey-white and dove-blue
Noise level	39 dBA @ 1 m (acc. to ISO 7779)
Period tests	Inspection according to the manufacturers specifications every 12 months (Germany: safety check according to §6 Medical Device Operator Ordinance).
Protection class (EN 60601-1)	II, protective earth conductor only for EMC protection
Degree of protection	Application parts type CF, defibrillator-proof, recovery time: 10 sec
Type of protection	IP X0
Classification acc. to Appendix IX EC Directive 93/42/EEC	II a
CE marking	CE 0124
UMDNS code	10-218, suction device, thoracic
GMDN code	36787

* 1 bar ≈ 750,06 mm Hg ≈ 1000 hPa / depends on daily atmospheric pressure

Issue of Technical Specifications: 05.05.2015

10.0 Checking / Reprocessing / Disposal

10.1 Checking ATMOS suction devices

Carry out an inspection according to the manufacturer‘s specifications every 12 months (Germany: safety check according to §6 Medical Device Operator Ordinance). Depending on the number of recharging cycles of the batteries we recommend in this connection their exchange.

Regular, thoroughly cleaning and disinfection of the application parts respectively the operation in line with the operating instructions are assumed.

10.2 Reprocessing

In case secretion or any other liquids penetrated the device it must be reprocessed in order to protect patient and user. For hygienic reasons ATMOS recommends a yearly reprocessing. This reprocessing may only be performed by ATMOS or an authorised specialist.

ATMOS MedizinTechnik GmbH & Co. KG offers their partners and customers a trouble-free and quick reprocessing and checking / safety-relevant control for ATMOS suction devices.

10.3 Disposal

- The ATMOS® E 201 Thorax is not comprised of any hazardous materials.
- The materials of the housing can be recycled completely.
- Prior to disposal, device and accessories must be decontaminated.
- The materials are to be separated carefully.
- Pay attention to country-specific regulations for disposal (e. g. waste incineration).

Disposal within the EU

The suction device described above is a high-quality medical product with a long service life. After its life cycle it must be disposed professionally. According to the EU directives (WEEE and RoHS) the device may not be disposed in domestic waste. Please observe existing national laws and rules for disposal of old devices.

Disposal within the Federal Republic of Germany

In the Federal Republic of Germany the law for electrical devices (ElektroG) rules the disposal of electrical devices. It must be assumed that those suction devices could be contaminated. Therefore, this type of device is excluded from the law for electrical devices. In order to guarantee a proper disposal of your old device, please either pass on your old device to your specialised dealer or send it directly to ATMOS MedizinTechnik GmbH & Co. KG for a professional disposal.

Prior to disposal respectively before transport all secretion canisters and hoses must be removed. The device surface must be disinfected.

11.0 Notes on EMC

- Medical electrical equipment is subject to special precautions with regard to EMC and must be installed acc. to following EMC notes.
- Portable and mobile HF communication facilities can influence medical electrical equipment.
- The use of other accessories, other converters and cables than stated may lead to an increased emission or a reduced interference immunity of the equipment or system.

11.1 Guidelines and Manufacturer´s Declaration - Emissions

The ATMOS® E 201 Thorax workstation is intended for use in the electromagnetic environment specified below. The customer or user of the ATMOS® E 201 Thorax should ensure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF Emissions CISPR 11	Group 1	The ATMOS® E 201 Thorax uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class B	The ATMOS® E 201 Thorax is suitable for use in all establishments, including domestic, and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonics IEC 61000-3-2	Class A	
Flicker IEC 61000-3-3	Match	

11.2 Guidelines and Manufacturer´s Declaration - Immunity for ATMOS® E 201 Thorax

The ATMOS® E 201 Thorax is intended for use in the electromagnetic environment specified below. The customer or user of the ATMOS® E 201 Thorax should ensure that it is used in such an environment.

Immunity Test	IEC 60601- Test Level	Compliance Level	Electromagnetic Environment - Guidance
ESD IEC 61000-4-2	± 6 kV Contact ± 8 kV Air	± 6 kV Contact ± 8 kV Air	Floors should be wood, concrete, or ceramics tile. If floors are synthetic, the relative humidity should be at least 30%.
EFT IEC 61000-4-4	± 2 kV Mains ± 1 kV I/Os	± 2 kV Mains inapplicable ± 1 kV I/Os	Mains power quality should be that of a typical commercial or hospital environment.
Surges IEC 61000-4-5	± 1 kV Differential ± 2 kV Common	± 1 kV Differential ± 2 kV Common	Mains power quality should be that of a typical commercial or hospital environment.
Power Frequency 50/60 Hz Magnetic field IEC 61000-4-8	3 A/m	Applicable 3 A/m	Power frequency magnetic fields should be that of a typical commercial or hospital environment.

11.0 Notes on EMC

Immunity Test	IEC 60601- Test Level	Compliance Level	Electromagnetic Environment - Guidance
Voltage Dips / Dropout IEC 61000-4-11	< 5 % U_T (> 95 % Dip of the U_T) for 0.5 Cycles 40 % U_T (60% Dip of the U_T) for 5 Cycles 70% U_T (30 % Dip of the U_T) for 25 Cycles < 5 % U_T (>95 % Dip of the U_T) for 5 s	< 5 % U_T (> 95 % Dip of the U_T) for 0.5 Cycles 40 % U_T (60% Dip of the U_T) for 5 Cycles 70% U_T (30 % Dip of the U_T) for 25 Cycles < 5 % U_T (>95 % Dip of the U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the ATMOS® E 201 Thorax demands continued function even in case of interruptions of the energy supply, it is recommended to supply the ATMOS® E 201 Thorax from an uninterruptible current supply or a battery.
NOTE U_T is the mains alternating current prior to application of the test levels.			

11.3 Guidelines and Manufacturer´s Declaration - Immunity

The ATMOS® E 201 Thorax is intended for use in the electromagnetic environment specified below. The customer or user of the ATMOS® E 201 Thorax should ensure that it is used in such an environment.

Immunity Test	IEC 60601- Test Level	Compliance Level	Electromagnetic Environment - Guidance
			Portable and mobile communications equipment should be separated from the ATMOS® E 201 Thorax incl. the cables by no less than the distances calculated/listed below. **Recommended distances:** d = [3,5 / V_1] √**P** d = [3,5 / E_1] √**P** 80 MHz to 800 MHz d = [7,0 / E_1] √**P** 800 MHz to 2500 MHz where „P“ is the max. power in watts (W) and D is the recommended separation distance in meters (m). Field strengths from fixed transmitters, as determined by an electromagnetic site (*a*) survey, should be less than the compliance level (*b*). Interference may occur in the vicinity of equipment containing following symbol.
Conducted RF IEC 61000-4-6	V_1 = 3 V_{eff} 150 kHz to 80 MHz	3 V	
Radiated RF IEC 61000-4-3	E_1 = 3 V/m 80 MHz to 2,5 GHz	3 V/m	

NOTE 1	With 80 MHz and 800 MHz the higher frequency range applies.
NOTE 2	These guidelines might not be applicable in any case. The propagation of electromagnetic sizes is influenced by absorptions and reflections of buildings, objects and people.
a	The field strength of stationary transmitters, such as base stations of cellular phones and mobile terrain radio equipment, amateur radio transmitters, cbm broadcast and TV stations cannot be predestined exactly. To determine the electromagnetic environment in regard to stationary transmitters, a study of the location is to be considered. If the measured field strength at the location where the ATMOS® E 201 Thorax is used exceeds the above compliance level, the ATMOS® E 201 Thorax is to be observed to verify the intended use. If abnormal performance characteristics are noted, additional measures might be necessary, e. g. a changed arrangement or another location for the device.
b	Within the frequency range of 150 kHz to 80 MHz the field strength is to be below 3 V/m.

11.4 Recommended separations between portable and mobile RF communications equipment and the ATMOS® E 201 Thorax

Recommended separations between portable and mobile RF communications equipment and the ATMOS® E 201 Thorax			
The ATMOS® E 201 Thorax is intended for use in electromagnetic environment in which radiated disturbances are controlled. The customer or user of the ATMOS® E 201 Thorax can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment and the ATMOS® E 201 Thorax as recommended below, according to the maximum output power of the communications equipment.			
	Separation distance, depending on transmit-frequency m		
Nominal output of the transmitter **W**	**150 kHz to 80 MHz** **d =** [3,5 / 3] √**P**	**80 MHz to 800 MHz** **d =** [3,5 / 3] √**P**	**800 MHz to 2,5 GHz** **d =** [7,0 / 3] √**P**
0.01	0.12	0.12	0.233
0.1	0.37	0.37	0.74
1	1.16	1.16	2.33
10	3.69	3.69	7.38
100	11.66	11.66	23.33
For transmitters for which the maximum nominal output is not indicated in the above table, the recommended separation distance *d* in meters (m) can be determined using the equation belonging to the respective column whereas *P* is the maximum nominal output of the transmitter in watts (W) acc. to manufacturer´s specification. NOTE 1 With 80 MHz and 800 MHz the higher frequency range applies. NOTE 2 These guidelines might not be applicable in any case. The propagation of electromagnetic sizes is influenced by absorptions and reflections of buildings, objects and people.			

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